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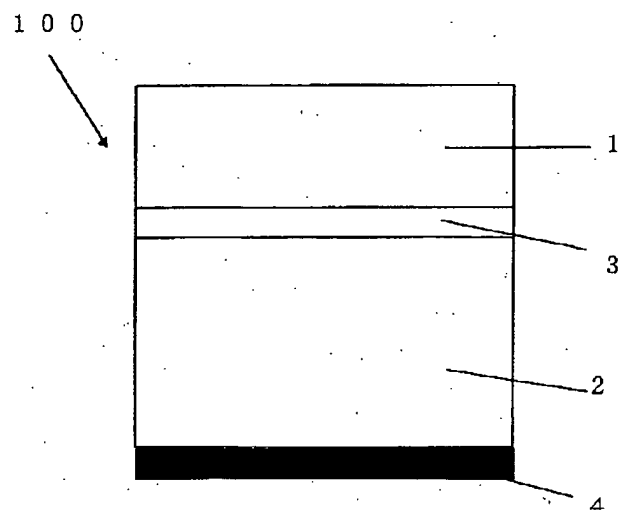
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(54) 【発明の名称】 防音材

(57) 【要約】

【課題】 本発明は、車室内外で発生した騒音に対して遮音や吸音を可能とする軽量の防音材の提供を目的とする。

【解決手段】 本発明の構成によれば、車両用の防音材100において、車室内側より順に、第1の通気性吸音層1、非通気性樹脂膜層3、第2の通気性吸音層2の順に接着され、第1の通気性吸音層1と車室内の間には非通気層を有せず、第2通気性吸音層2の反車室内側にも非通気層を有しない防音材であって、非通気性樹脂膜層3は、厚み500μm以下、ヤング率0.5～5000MPa、防音材100自体の1次共振周波数は200～800Hzであることを特徴とする。第1の通気性吸音層1と非通気性樹脂膜層3はエンジンルームからの騒音を車室内に伝播しないように遮断でき、第2の通気性吸音層2はエンジンルームからの騒音を吸収できる。



## 【特許請求の範囲】

【請求項1】車両用の防音材において、車室内側より順に、第1の通気性吸音層、非通気性樹脂膜層、第2の通気性吸音層の順に接着され、第1の通気性吸音層と車室内の間には非通気層を有せず、第2通気性吸音層の反車室内側にも非通気層を有しない防音材であって、非通気性樹脂膜層は、厚み500 $\mu$ m以下、ヤング率0.5～5000MPa、防音材自体の1次共振周波数は200～800Hzであることを特徴とする防音材。

【請求項2】第1の通気性吸音層及び第2の通気性吸音層の密度は0.02～0.5g/cm<sup>3</sup>かつ厚さは0.5mm以上であることを特徴とする請求項1に記載の防音材。

【請求項3】車室内側に第1の通気性吸音層が配置されるよう、請求項1または請求項2に記載の防音材を複数重ね合わせたことを特徴とする防音材。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、例えば自動車のエンジンルーム内の騒音が車室内に伝播することを防止するため且つ車室内の騒音を吸音するための、防音材に関

## 【0002】

【従来の技術】従来では例えばエンジンルーム内の騒音が車室内に伝播するのを防止するための防音材がエンジンルームと車室内を仕切るダッシュパネルの車室内側に配置されている。また、前記防音材は車室内の床面上においてフロアーカーペットの下方に用いられることもある。

【0003】例えば、特開平9-76391号では空気層及び隔壁からなる遮音構造を二重遮音構造とすると共に、前記空気層及び隔壁を所定の関係としているので、共振周波数域の遮音性の低下がなく、しかも高周波域の遮音性が向上する遮音構造が開示されている。さらに、特許第2956441号には非通気性の表皮材、フェルト層、中間シート、フェルト層の順に積層された防音材が開示されており、ここではフェルト層が特定のバネ定数を有することによる防音効果が開示されている。

【0004】このように、従来の防音材は主に、吸音層と遮音層の二つの観点からなる層によって構成されていた。前記吸音層とはフェルト材、ウレタン材、繊維材などの通気性を有する空気層を用いて騒音を吸収するものである。また、前記遮音層とは塩化ビニル、オレフィン系熱可塑性エラストマ、ゴム材料などの高分子材料を用いておりかつ非通気性である。これは遮音の目的において、特に音を通過させない事を目的とした技術思想のために非通気としている。こうした非通気層は音を通過させない目的と同時に騒音の原因となる振動をも吸収させる目的で使用されていた。この為、非通気性の遮音層の一般的なものとしては塩化ビニル層で構成され、しか

も数mm単位での厚みを有する重量層が用いられていた。従来では、こうした通気性を有する主に吸音を目的とした吸音層と非通気性の遮音層の重ね合わせにより防音材を構成していた。

## 【0004】

【発明が解決しようとする課題】しかしながら、例えばダッシュパネルにおいては車室内とエンジンルーム間を様々な電装計器部品を連結させるために連通口を設けなければならない、その連通口により騒音が車室内に洩れ、結果防音材の意図が薄れてしまうものであった。さらに、従来の防音材は、いかにして騒音を車室内へ入り込ませないかという観点のみに絞られており、室内に入り込んでしまった、あるいは室内で発生した騒音を低減させることを目的としたものはほとんどなかった。

【0005】つまり、騒音源としては例えばエンジンルームや走行時のタイヤからの固体伝播による音など様々であるが、従来の防音材はエンジンルームからの騒音や固体伝播による騒音を遮断することにしか研究されておらず、車室外から車室内に洩れた騒音や、車室内で発生した騒音を防音材で吸収するという技術思想が見られなかった。

【0006】加えて、従来の遮音を目的とした非通気性の遮音層は重量が大きければ大きい程遮音効果があるという一義的な考えに基づいた技術思想しか見受けられず遮音や制振を高める一方で軽量化を図るという、いわば、相反した課題を同時に解決するという技術思想も見受けられなかった。

【0007】本発明は、防音材を通過し車室内側に漏れた騒音を再吸収するとともに、エンジンルーム外から車室内に進入してくる騒音も遮音及び吸音できる防音材を提供すること、かつ、軽量化も考慮した防音材の提供を課題とする。

## 【0008】

【発明を解決するための手段】（第1発明の構成）車両用の防音材において、車室内側より順に、第1の通気性吸音層、非通気性樹脂膜層、第2の通気性吸音層の順に接着され、第1の通気性吸音層と車室内の間には非通気層を有せず、第2通気性吸音層の反車室内側にも非通気層を有しない防音材であって、非通気性樹脂膜層は、厚み500 $\mu$ m以下、ヤング率0.5～5000MPa、防音材自体の1次共振周波数は200～800Hzであることを特徴とする。

【0009】（第2の発明の構成）第1の発明の構成に対して、さらに、第1の通気性吸音層及び第2の通気性吸音層の密度は0.02～0.5g/cm<sup>3</sup>かつ厚さは0.5mm以上であるという要件を追加した構成であることを特徴とする。

【00010】（第3の発明の構成）車室内側に第1の通気性吸音層が配置されるよう、第1の発明の構成あるいは第2の発明の構成を複数重ね合わせたことを特徴と

する防音材。

【00011】

【発明の実施の形態】以下、本発明の遮音構造の一例について図面を参照にして説明するが、本発明はこれに限定されるものではない。

【00012】本発明の車両用の防音材は、車室内側より順に、第1の通気性吸音層、非通気性樹脂膜層、第2の通気性吸音層の順に積層される。

【00013】本発明はさらに、第1の通気性吸音層と車室内の間には非通気層を有しない。これは、車室内へ洩れた騒音が車室にこもったものを再び第1の通気性吸音層で吸収させる目的があることや、車室内で発生した騒音をも吸収させることを目的としている。また、第2の通気性吸音層の反車室内側にも非通気層を有しない防音材である。これは、可及的に軽量化を追求する本発明において、単純な遮音の為に非通気層の増加は遮音の効果の代償として重量増加を誘発するため、望ましい構成となり得ない為である。

【00014】非通気性樹脂膜層は、厚み500 $\mu$ m以下である。遮音層としての従来の概念からは大きくかけ離れた極めて厚みの薄い構成である。これは、この非通気性樹脂膜層が柔軟な薄層よりなることで、第1の通気性吸音層や第2の通気性吸音層を通過した騒音や振動がこの非通気性樹脂膜層に干渉し、薄膜振動を発現させているものと推察する。

【00016】これにより、前記の薄膜振動は第1の通気性吸音層および第2の通気性吸音層のパネマス効果と呼応して、結果、他の非通気な重い遮音層を必要とすることなく効果的な防音効果を発現しているものと思慮する。

【00016】特に、本発明の防音材自体の1次共振周波数は200～800Hzである。また、第1の通気性吸音層や第2の通気性吸音層は周波数1000Hz以上の高周波数領域の騒音を吸収し、非通気性樹脂膜層は周波数1000Hz以下の低周波領域の騒音を遮断吸収できると考えられている。

【00017】ところで、従来技術では吸音層と遮音層を単純に積層しただけにあつては、吸音性については周波数400Hz付近で吸音のピーク値をしめし、400Hz付近以上では明らかに吸音性能を落としている実測値となっている。

【00018】しかし、本発明が従来と異なる最大の効果は、本発明の構成により400Hz付近の周波数以上において高レベルでの吸音を発現できることにある。

【00019】また、遮音性についても本発明の構成により1600Hz以上の透過損失が従来の構成より優れている。

【00020】

【実施例】本発明の実施例に関する防音材につき、図1を用いて説明する。エンジンルームと車室内側とを隔壁

するダッシュパネル4に面して防音材100を配置している。防音材100は、車室内側より順に、第1の通気性吸音層1、非通気性樹脂膜層3、第2の通気性吸音層2の順に積層されている。

【00021】第1の通気性吸音層1はウレタン発泡材と繊維の混合材を用いている。この混合材は車両廃材からのリサイクル材を用いており、密度は0.05g/cm<sup>3</sup>、厚さは2mmであり、防音材を構成する場合にはこの範囲において密度および厚さを必要に応じて変化させる。また防音材を構成する要素としては、密度は0.02～0.8g/cm<sup>3</sup>、厚さは1～20mmの範囲において必要に応じて変化させることが好ましい。なお、ウレタン以外に、フェルト、発泡体、天然繊維や合成繊維体、あるいは熔融繊維を混織させて熱融着させた繊維体など様々なものを用いることができる。

【00022】非通気性樹脂膜層3は3層構造をとっており、ポリエチレン、ナイロン、ポリエチレンの順に積層した樹脂フィルムである。厚さは45 $\mu$ mである。材質としてはこの他、ポリプロピレンやポリエチレンテレフタレートなど熱可塑性樹脂が好ましい。

【00022】第2の通気性吸音層2もウレタン発泡材と繊維の混合材を用いている。この混合材も車両廃材からのリサイクル材を用いており、密度は0.06g/cm<sup>3</sup>、厚さは20mmであり、防音材を構成する場合にはこの範囲において密度および厚さを必要に応じて変化させる。また防音材を構成する要素としては、密度は0.02～0.8g/cm<sup>3</sup>、厚さは1～20mmの範囲において必要に応じて変化させることが好ましい。なお、ウレタンと繊維の混合材以外に、フェルト、発泡体、天然繊維や合成繊維体、あるいは熔融繊維を混織させて熱融着させた繊維体など様々なものを用いることができる。

【00023】実施例と比較例のデータ比較を行ったので図2に示す。比較例の構成は、実施例と同じウレタン発泡材を用いた。ダッシュパネルに20mm厚みを有する前記ウレタン発泡材を積層し、その上に、つまり車室内側に厚さ1mmで2g/cm<sup>3</sup>の塩化ビニルシートを用いている。図2において、本実施例は比較例に比べて、明らかに低周波数から高周波数までを広範囲において防音できている。

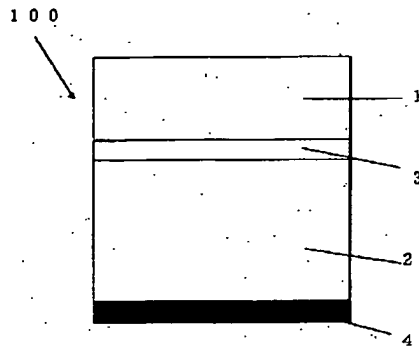
【発明の効果】本発明の構成によれば、車室内側の騒音を第1の通気性吸音層で吸収でき、第1の通気性吸音層と非通気性樹脂膜層はエンジンルームからの騒音を車室内に伝播しないように遮断でき、第2の通気性吸音層はエンジンルームからの騒音を吸収できる。こうした構成にすることにより、例えば、この防音材がダッシュパネルに用いられる場合、ダッシュパネル用の防音材はエンジンルームと車室内とを結ぶ配線の孔を多数設けなければいけない構造の際にでも、その孔を通じてエンジンルームから車室内へ洩れた騒音を再び車室内側に位置する

第1の通気性吸音材にて吸音することができる。また、本発明の構成は非通気な重量層の構成を除外し、特定の吸音層および樹脂膜層の組み合わせによって生ずる振動減衰と吸音の効果および樹脂膜層の膜振動による遮蔽と吸音のこうかにより優れた防音性能を発現する。従って大幅に軽量化を達成することができる。

【図面の簡単な説明】

【図1】防音材の断面図

【図1】



\* 【図2】吸音率のグラフ

【符号の説明】

100 防音材

1 第1の通気性吸音層

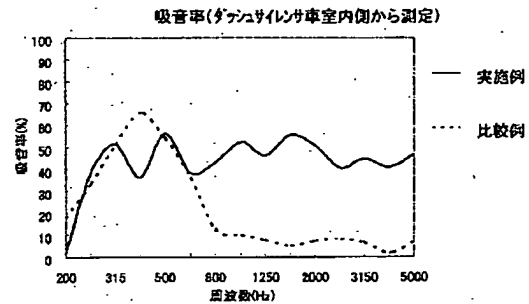
2 第2の通気性吸音層

3 非通気性樹脂膜層

4 ボディパネル

\*

【図2】



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BD21  
4F100 AK01B AK04B AK46B AK51A  
AK51C ARO0A ARO0C BA03  
BA06 BA10A BA10C DG01A  
DG01C DJ01A DJ01C GB33  
JA13A JA13C JA20A JA20C  
JD02A JD02B JD02C JH01A  
JH01C JH10 JL03 YY00  
YY00A YY00C  
5D061 AA06 AA22 AA26 BB01

## CLAIMS

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### [Claim(s)]

[Claim 1] In the sound insulating material for cars in order [ side / vehicle interior-of-a-room ] The 1st permeability absorption-of-sound layer, Paste up in order of a non-permeability resin membrane layer and the 2nd permeability absorption-of-sound layer, and it does not have a non-aeration layer between the 1st permeability absorption-of-sound layer and the vehicle interior of a room. It is the sound insulating material with which it is the sound insulating material which does not have a non-aeration layer in the anti-vehicle interior-of-a-room side of the 2nd permeability absorption-of-sound layer, either, and a non-permeability resin membrane layer is characterized by the primary resonance frequency of the thickness of 500 micrometers or less, Young's modulus 0.5 - 5000MPa, and the sound insulating material itself being 200-800Hz.

[Claim 2] For 0.02 - 0.5 g/cm<sup>3</sup> and thickness, the consistency of the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer is a sound insulating material according to claim 1 characterized by being 0.5mm or more.

[Claim 3] The sound insulating material characterized by setting a sound insulating material according to claim 1 or 2 in two or more [-fold ] so that the 1st permeability absorption-of-sound layer may be arranged at a vehicle interior-of-a-room side.

## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the sound insulating material for absorbing sound the noise of the vehicle interior of a room in order to prevent that the noise in the engine room of an automobile spreads to the vehicle interior of a room.

[0002]

[Description of the Prior Art] In the former, the sound insulating material for preventing that the noise for example, in an engine room spreads to the vehicle interior of a room is arranged at the vehicle interior-of-a-room side of

the dash panel which divides an engine room and the vehicle interior of a room. Moreover, in above the floor level [ of the vehicle interior of a room / sound insulating material / said ], a floor carpet may be used caudad.

[0003] For example, since said air space and septum are considered as predetermined relation while making into duplex sound insulating construction sound insulating construction which consists of an air space and a septum in JP,9-76391,A, there is no fall of the insulation of a resonance frequency region, and the sound insulating construction whose insulation of a RF region moreover improves is indicated. Furthermore, the sound insulating material by which the laminating was carried out is indicated by patent No. 2956441 at the order of the epidermis material of non-permeability, a felt layer, a middle sheet, and a felt layer, and the sound isolation effectiveness by a felt layer having a specific load rate is indicated here.

[0004] Thus, the conventional sound insulating material was mainly constituted by the layer which becomes from two viewpoints, an absorption-of-sound layer and a noise insulation layer. Said absorption-of-sound layer absorbs the noise using the air space which has the permeability of felt material, urethane material, a fiber material, etc. Moreover, said noise insulation layer uses polymeric materials, such as a vinyl chloride, thermoplastic elastomer olefin, and a rubber ingredient, and is non-permeability. Especially this is taken as non-aeration in the purpose of noise insulation for the technical thought aiming at not passing a sound. Such a non-aeration layer was used the making the purpose which does not pass a sound, and coincidence also absorb the vibration leading to the noise purpose. For this reason, as a general thing of the noise insulation layer of non-permeability, it consisted of \*\*\*\*\*, and the weight layer which moreover has the thickness in several mm unit was used. The superposition of the aiming at absorption of sound absorption-of-sound-mainly layer which has such permeability, and the noise insulation layer of non-permeability constituted the sound insulating material from the former.

[0004]

[Problem(s) to be Solved by the Invention] However, the noise was that to which free passage opening must be prepared in order to, make various electrical instrument components connect between the vehicle interior of a room and an engine room in a dash panel for example, and intention to be a

sound insulating material as a result of a leak fades in the vehicle interior of a room with the free passage opening. Furthermore, the conventional sound insulating material is extracted only to the viewpoint of how the noise is not made to enter to the vehicle interior of a room, and there was almost nothing aiming at reducing the noise which has entered indoors or was generated indoors.

[0005] That is, although the engine room, the sound by the solid-state propagation from the tire at the time of transit, etc. were various as a noise source, it only inquired that the conventional sound insulating material intercepts the noise from an engine room and the noise by solid-state propagation, and the technical thought of absorbing the noise which leaked to the vehicle outdoor empty vehicle interior of a room, and the noise generated in the vehicle interior of a room with a sound insulating material was not seen.

[0006] In addition, the more the noise insulation layer of the non-permeability aiming at the conventional noise insulation had large weight, while only the technical thought based on the most important idea that there is an effect of intercepting noise could be seen but noise insulation and vibration deadening were raised the more, the technical thought of attaining lightweight-ization and of so to speak solving the conflicting technical problem to coincidence was not able to be seen, either.

[0007] This invention makes a technical problem to offer the sound insulating material with which the noise which advances into the empty vehicle interior of a room outside an engine room can also insulate and absorb sound, and offer of the sound insulating material also in consideration of lightweight-ization while carrying out resorption of the noise which passed the sound insulating material and leaked to the vehicle interior-of-a-room side.

[0008]

[The means for solving invention] In the sound insulating material for cars in order [ side / vehicle interior-of-a-room ] The 1st permeability absorption-of-sound layer, (Configuration of the 1st invention) Paste up in order of a non-permeability resin membrane layer and the 2nd permeability absorption-of-sound layer, and it does not have a non-aeration layer between the 1st permeability absorption-of-sound layer and the vehicle interior of a room. It is the sound insulating material which does not have a non-aeration

layer in the anti-vehicle interior-of-a-room side of the 2nd permeability absorption-of-sound layer, either, and a non-permeability resin membrane layer is characterized by the primary resonance frequency of the thickness of 500 micrometers or less, Young's modulus 0.5 - 5000MPa, and the sound insulating material itself being 200-800Hz.

[0009] (2nd configuration of invention) It is further characterized by the consistency of the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer being the configuration of having added the requirements that 0.02 - 0.5 g/cm<sup>3</sup> and thickness were 0.5mm or more to the 1st configuration of invention.

[0010] (3rd configuration of invention) The sound insulating material characterized by doubling the 1st configuration of invention, or the configuration of the 2nd invention in two or more [-fold ] so that the 1st permeability absorption-of-sound layer may be arranged at a vehicle interior-of-a-room side.

[0011]

[Embodiment of the Invention] Hereafter, although a drawing is made reference and explained about an example of the sound insulating construction of this invention, this invention is not limited to this.

[0012] The laminating of the sound insulating material for the cars of this invention is carried out to order from a vehicle interior-of-a-room side at the order of the 1st permeability absorption-of-sound layer, a non-permeability resin membrane layer, and the 2nd permeability absorption-of-sound layer.

[0013] This invention does not have a non-aeration layer between further the 1st permeability absorption-of-sound layer and the vehicle interior of a room. This aims at that there is the purpose which makes that by which the vehicle room was filled with the noise which leaked to the vehicle interior of a room absorb in the 1st permeability absorption-of-sound layer again, or making the noise which occurred in the vehicle interior of a room absorb. Moreover, it is the sound insulating material which does not have a non-aeration layer in the anti-vehicle interior-of-a-room side of the 2nd permeability absorption-of-sound layer, either. In this invention to which this pursues lightweight-ization as much as possible, the increment in the non-aeration layer for simple noise insulation is because it cannot become a desirable configuration in order to induce the increment in weight in compensation for the effectiveness of noise insulation.

[0014] A non-permeability resin membrane layer is 500 micrometers or less in thickness. From the conventional concept as a noise insulation layer, it is the thin configuration of



thickness which was greatly different widely very much. It is that this non-permeability resin membrane layer consists of a flexible thin layer, the noise and vibration which passed the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer interfere in this non-permeability resin membrane layer, and this imagines it as the thing which is making thin film vibration discover.

[0016] Thereby, the aforementioned thin film vibration is in sympathy with the spring mass effectiveness of the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer, and it thinks about it with having discovered the effective sound isolation effectiveness, without needing a result and a heavy noise insulation layer [ un-aeration / others ].

[0016] Especially the primary resonance frequency of the sound insulating material of this invention itself is 200-800Hz. Moreover, the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer absorb the noise of a high-frequency field with a frequency of 1000Hz or more, and it is thought that a non-permeability resin membrane layer can carry out cutoff absorption of the noise of a low frequency field with a frequency of 1000Hz or less.

[0017] By the way, with the conventional technique, because the laminating of an absorption-of-sound layer and the noise insulation layer was carried out simply, if it is, about absorption-of-sound nature, the peak value of absorption of sound is shown near the frequency of 400Hz, and it has an actual measurement from which the absorption-of-sound engine performance is clearly dropped above near 400Hz.

[0018] However, the greatest effectiveness that this invention differs from the former is to be able to discover absorption of sound with a high level by the configuration of this invention more than the cycle near 400Hz.

[0019] Moreover, transmission loss 1600Hz or more is superior to the conventional configuration also about insulation with the configuration of this invention.

[0020]

[Example] It explains about the sound insulating material about the example of this invention using drawing 1 . The dash panel 4 which carries out the septum of an engine room side and the vehicle interior-of-a-room side was faced, and the sound insulating material 100 is arranged. The laminating of the sound insulating material 100 is carried out to order from the vehicle interior-of-a-room side at the order of the 1st permeability absorption-of-sound layer 1, the non-permeability resin membrane layer 3, and the 2nd permeability absorption-of-sound layer 2.

[0021] The 1st permeability absorption-of-sound layer 1 uses urethane foam and the admixture of fiber. This admixture uses the recycle material from car scrap wood, a

consistency is 3 and 0.05g/cm of thickness is 2mm, and in constituting a sound insulating material, in this range, it changes a consistency and thickness if needed. Moreover, it is desirable to set a consistency to 0.02 - 0.8 g/cm<sup>3</sup>, to set thickness in the range of 1-20mm, and to make it change as an element which constitutes a sound insulating material if needed. In addition, various things, such as a fiber object which was made to interweave the felt, foam, a natural fiber, and a synthetic-fiber object or melting fiber, and carried out thermal melting arrival, can be used in addition to urethane.

[0022] The non-permeability resin membrane layer 3 has taken the three-tiered structure, and are polyethylene, nylon, and the resin film that carried out the laminating to the order of polyethylene. Thickness is 45 micrometers. In addition to this as the quality of the material, thermoplastics, such as polypropylene and polyethylene terephthalate, is desirable.

[0022] The 2nd permeability absorption-of-sound layer 2 also uses urethane foam and the admixture of fiber. This admixture also uses the recycle material from car scrap wood, a consistency is 3 and 0.06g/cm of thickness is 20mm, and in constituting a sound insulating material, in this range, it changes a consistency and thickness if needed. Moreover, it is desirable to set a consistency to 0.02 - 0.8 g/cm<sup>3</sup>, to set thickness in the range of 1-20mm, and to make it change as an element which constitutes a sound insulating material if needed. In addition, various things, such as a fiber object which was made to interweave the felt, foam, a natural fiber, and a synthetic-fiber object or melting fiber, and carried out thermal melting arrival, can be used in addition to the admixture of urethane and fiber.

[0023] Since the data comparison of an example and the example of a comparison was performed, it is shown in drawing 2 . The configuration of the example of a comparison used the same urethane foam as an example. The laminating of said urethane foam which has 20mm thickness is carried out to a dash panel, and the chlorination vinyl sheet of 2 g/cm<sup>3</sup> is used by 1mm in thickness on it (i.e., a vehicle interior-of-a-room side). In drawing 2 , compared with the example of a comparison, this example sets from low frequency to high frequency broadly clearly, and can be soundproofed.

[Effect of the Invention] According to the configuration of this invention, the noise by the side of the vehicle interior of a room is absorbable in the 1st permeability absorption-of-sound layer, and the 1st permeability absorption-of-sound layer and a non-permeability resin membrane layer can be intercepted so that the noise from an engine room may not be spread to the vehicle interior of a room, and the 2nd permeability absorption-of-sound layer can absorb the noise from an engine room.

making it such a configuration -- for example, when this sound insulating material is used for a dash panel, the sound insulating material for dash panels can absorb sound the noise which leaked to the engine room empty vehicle interior of a room through that hole even on the occasion of the structure where many holes of wiring which connects an engine room and the vehicle interior of a room must be prepared with the 1st permeability acoustic material again located in a vehicle interior-of-a-room side. Moreover, the configuration of this invention excepts the configuration of an un-aeration weight layer, and discovers the effectiveness of the periodic damping produced with the combination of a specific absorption-of-sound layer and a resin membrane layer, and absorption of sound, and the sound isolation engine performance of electric shielding and absorption of sound by film vibration of a resin membrane layer which was excellent like this or. Therefore, lightweight-ization can be attained sharply.

## TECHNICAL FIELD

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[Field of the Invention] This invention relates to the sound insulating material for absorbing sound the noise of the vehicle interior of a room in order to prevent that the noise in the engine room of an automobile spreads to the vehicle interior of a room.

## PRIOR ART

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[Description of the Prior Art] In the former, the sound insulating material for preventing that the noise for example, in an engine room spreads to the vehicle interior of a room is arranged at the vehicle interior-of-a-room side of the dash panel which divides an engine room and the vehicle interior of a room. Moreover, in above the floor level [ of the vehicle interior of a room / sound insulating material / said ], a floor carpet may be used caudad.

[0003] For example, since said air space and septum are considered as predetermined relation while making into duplex sound insulating construction sound insulating construction which consists of an air space and a septum in JP,9-76391,A, there is no fall of the insulation of a resonance frequency region, and the sound insulating construction whose insulation of a RF region moreover improves is indicated. Furthermore, the sound insulating material by which the laminating was carried out is indicated by patent No. 2956441 at the order of the epidermis material of

non-permeability, a felt layer, a middle sheet, and a felt layer, and the sound isolation effectiveness by a felt layer having a specific load rate is indicated here.

[0004] Thus, the conventional sound insulating material was mainly constituted by the layer which becomes from two viewpoints, an absorption-of-sound layer and a noise insulation layer. Said absorption-of-sound layer absorbs the noise using the air space which has the permeability of felt material, urethane material, a fiber material, etc. Moreover, said noise insulation layer uses polymeric materials, such as a vinyl chloride, thermoplastic elastomer olefin, and a rubber ingredient, and is non-permeability. Especially this is taken as non-aeration in the purpose of noise insulation for the technical thought aiming at not passing a sound. Such a non-aeration layer was used the making the purpose which does not pass a sound, and coincidence also absorb the vibration leading to the noise purpose. For this reason, as a general thing of the noise insulation layer of non-permeability, it consisted of \*\*\*\*\*, and the weight layer which moreover has the thickness in several mm unit was used. The superposition of the aiming at absorption of sound absorption-of-sound-mainly layer which has such permeability, and the noise insulation layer of non-permeability constituted the sound insulating material from the former.

## EFFECT OF THE INVENTION

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[Effect of the Invention] According to the configuration of this invention, the noise by the side of the vehicle interior of a room is absorbable in the 1st permeability absorption-of-sound layer, and the 1st permeability absorption-of-sound layer and a non-permeability resin membrane layer can be intercepted so that the noise from an engine room may not be spread to the vehicle interior of a room, and the 2nd permeability absorption-of-sound layer can absorb the noise from an engine room. making it such a configuration -- for example, when this sound insulating material is used for a dash panel, the sound insulating material for dash panels can absorb sound the noise which leaked to the engine room empty vehicle interior of a room through that hole even on the occasion of the structure where many holes of wiring which connects an engine room and the vehicle interior of a room must be prepared with the 1st permeability acoustic material again

located in a vehicle interior-of-a-room side. Moreover, the configuration of this invention excepts the configuration of an un-aeration weight layer, and discovers the effectiveness of the periodic damping produced with the combination of a specific absorption-of-sound layer and a resin membrane layer, and absorption of sound, and the sound isolation engine performance of electric shielding and absorption of sound by film vibration of a resin membrane layer which was excellent like this or. Therefore, lightweight-ization can be attained sharply.

## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, the noise was that to which free passage opening must be prepared in order to, make various electrical instrument components connect between the vehicle interior of a room and an engine room in a dash panel for example, and intention to be a sound insulating material as a result of a leak fades in the vehicle interior of a room with the free passage opening. Furthermore, the conventional sound insulating material is extracted only to the viewpoint of how the noise is not made to enter to the vehicle interior of a room, and there was almost nothing aiming at reducing the noise which has entered indoors or was generated indoors.

[0005] That is, although the engine room, the sound by the solid-state propagation from the tire at the time of transit, etc. were various as a noise source, it only inquired that the conventional sound insulating material intercepts the noise from an engine room and the noise by solid-state propagation, and the technical thought of absorbing the noise which leaked to the vehicle outdoor empty vehicle interior of a room, and the noise generated in the vehicle interior of a room with a sound insulating material was not seen.

[0006] In addition, the more the noise insulation layer of the non-permeability aiming at the conventional noise insulation had large weight, while only the technical thought based on the most important idea that there is an effect of intercepting noise could be seen but noise insulation and vibration deadening were raised the more, the technical thought of attaining lightweight-ization and of so to speak solving the conflicting technical problem to coincidence was not able to be seen, either.

[0007] This invention makes a technical problem to offer the sound insulating material with which the noise which advances into the empty vehicle interior of a room outside an engine room can also insulate and absorb sound, and offer of the sound insulating material also in consideration of lightweight-ization while carrying out resorption of the noise which passed the sound insulating material and leaked to the vehicle interior-of-a-room side.

## MEANS

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[The means for solving invention] In the sound insulating material for cars in order [ side / vehicle interior-of-a-room ] The 1st permeability absorption-of-sound layer, (Configuration of the 1st invention) Paste up in order of a non-permeability resin membrane layer and the 2nd permeability absorption-of-sound layer, and it does not have a non-aeration layer between the 1st permeability absorption-of-sound layer and the vehicle interior of a room. It is the sound insulating material which does not have a non-aeration layer in the anti-vehicle interior-of-a-room side of the 2nd permeability absorption-of-sound layer, either, and a non-permeability resin membrane layer is characterized by the primary resonance frequency of the thickness of 500 micrometers or less, Young's modulus 0.5 - 5000MPa, and the sound insulating material itself being 200-800Hz.

[0009] (2nd configuration of invention) It is further characterized by the consistency of the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer being the configuration of having added the requirements that 0.02 - 0.5 g/cm<sup>3</sup> and thickness were 0.5mm or more to the 1st configuration of invention.

[00010] (3rd configuration of invention) The sound insulating material characterized by doubling the 1st configuration of invention, or the configuration of the 2nd invention in two or more [-fold ] so that the 1st permeability absorption-of-sound layer may be arranged at a vehicle interior-of-a-room side.

[00011]

[Embodiment of the Invention] Hereafter, although a drawing is made reference and explained about an example of the sound insulating construction of this invention, this invention is not limited to this.

[0012] The laminating of the sound insulating material for the cars of this invention is carried out to order from a vehicle interior-of-a-room side at the order of the 1st permeability absorption-of-sound layer, a non-permeability resin membrane layer, and the 2nd permeability absorption-of-sound layer.

[0013] This invention does not have a non-aeration layer between further the 1st permeability absorption-of-sound layer and the vehicle interior of a room. This aims at that there is the purpose which makes that by which the vehicle room was filled with the noise which leaked to the vehicle interior of a room absorb in the 1st permeability absorption-of-sound layer again, or making the noise which occurred in the vehicle interior of a room absorb. Moreover, it is the sound insulating material which does not have a non-aeration layer in the anti-vehicle interior-of-a-room side of the 2nd permeability absorption-of-sound layer, either. In this invention to which this pursues lightweight-ization as much as possible, the increment in the non-aeration layer for simple noise insulation is because it cannot become a desirable configuration in order to induce the increment in weight in compensation for the effectiveness of noise insulation.

[0014] A non-permeability resin membrane layer is 500 micrometers or less in thickness. From the conventional concept as a noise insulation layer, it is the thin configuration of thickness which was greatly different widely very much. It is that this non-permeability resin membrane layer consists of a flexible thin layer, the noise and vibration which passed the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer interfere in this non-permeability resin membrane layer, and this imagines it as the thing which is making thin film vibration discover.

[0016] Thereby, the aforementioned thin film vibration is in sympathy with the spring mass effectiveness of the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer, and it thinks about it with having discovered the effective sound isolation effectiveness, without needing a result and a heavy noise insulation layer [ un-aeration / others ].

[0016] Especially the primary resonance frequency of the sound insulating material of this invention itself is 200-800Hz. Moreover, the 1st permeability absorption-of-sound layer and the 2nd permeability absorption-of-sound layer absorb the noise of a high-frequency field with a frequency of 1000Hz or more, and it is thought that a non-permeability resin membrane layer can

carry out cutoff absorption of the noise of a low frequency field with a frequency of 1000Hz or less.

[0017] By the way, with the conventional technique, because the laminating of an absorption-of-sound layer and the noise insulation layer was carried out simply, if it is, about absorption-of-sound nature, the peak value of absorption of sound is shown near the frequency of 400Hz, and it has an actual measurement from which the absorption-of-sound engine performance is clearly dropped above near 400Hz.

[0018] However, the greatest effectiveness that this invention differs from the former is to be able to discover absorption of sound with a high level by the configuration of this invention more than the cycle near 400Hz.

[0019] Moreover, transmission loss 1600Hz or more is superior to the conventional configuration also about insulation with the configuration of this invention.

## EXAMPLE

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[Example] It explains about the sound insulating material about the example of this invention using drawing 1. The dash panel 4 which carries out the septum of an engine room side and the vehicle interior-of-a-room side was faced, and the sound insulating material 100 is arranged. The laminating of the sound insulating material 100 is carried out to order from the vehicle interior-of-a-room side at the order of the 1st permeability absorption-of-sound layer 1, the non-permeability resin membrane layer 3, and the 2nd permeability absorption-of-sound layer 2.

[0021] The 1st permeability absorption-of-sound layer 1 uses urethane foam and the admixture of fiber. This admixture uses the recycle material from car scrap wood, a consistency is 3 and 0.05g/cm of thickness is 2mm, and in constituting a sound insulating material, in this range, it changes a consistency and thickness if needed. Moreover, it is desirable to set a consistency to 0.02 - 0.8 g/cm<sup>3</sup>, to set thickness in the range of 1-20mm, and to make it change as an element which constitutes a sound insulating material if needed. In addition, various things, such as a fiber object which was made to interweave the felt, foam, a natural fiber, and a synthetic-fiber object or melting fiber, and carried out thermal melting arrival, can be used in addition to urethane.



[0022] The non-permeability resin membrane layer 3 has taken the three-tiered structure, and are polyethylene, nylon, and the resin film that carried out the laminating to the order of polyethylene. Thickness is 45 micrometers. In addition to this as the quality of the material, thermoplastics, such as polypropylene and polyethylene terephthalate, is desirable.

[0022] The 2nd permeability absorption-of-sound layer 2 also uses urethane foam and the admixture of fiber. This admixture also uses the recycle material from car scrap wood, a consistency is 3 and 0.06g/cm of thickness is 20mm, and in constituting a sound insulating material, in this range, it changes a consistency and thickness if needed. Moreover, it is desirable to set a consistency to 0.02 - 0.8 g/cm<sup>3</sup>, to set thickness in the range of 1-20mm, and to make it change as an element which constitutes a sound insulating material if needed. In addition, various things, such as a fiber object which was made to interweave the felt, foam, a natural fiber, and a synthetic-fiber object or melting fiber, and carried out thermal melting arrival, can be used in addition to the admixture of urethane and fiber.

[0023] Since the data comparison of an example and the example of a comparison was performed, it is shown in drawing 2 . The configuration of the example of a comparison used the same urethane foam as an example. The laminating of said urethane foam which has 20mm thickness is carried out to a dash panel, and the chlorination vinyl sheet of 2 g/cm<sup>3</sup> is used by 1mm in thickness on it (i.e., a vehicle interior-of-a-room side). In drawing 2 , compared with the example of a comparison, this example sets from low frequency to high frequency broadly clearly, and can be soundproofed.

## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The sectional view of a sound insulating material

[Drawing 2] The graph of an acoustic absorptivity

[Description of Notations]

100 Sound Insulating Material

1 1st Permeability Absorption-of-Sound Layer

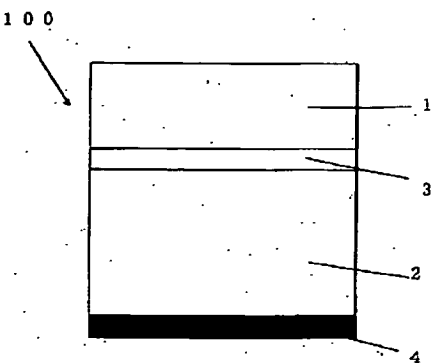
2 2nd Permeability Absorption-of-Sound Layer

3 Non-Permeability Resin Membrane Layer

4 Body Panel

DRAWINGS

[Drawing 1]



[Drawing 2]

